Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Time-Resolved Spectroscopy of the Ensemble Photoluminescence of Nitrogen- and Boron/Nitrogen-Doped Carbon Dots

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Supporting Information

Figure S1. (a) Normalized PL spectra of N-CD with varying excitation wavelengths from 310 to 450 nm with 20 nm increments. (b) Normalized excitation spectra of N-CD with varying emission wavelengths from 410 to 550 nm with 20 nm increments.

Figure S2. (a) Normalized PL spectra of BN-CD with varying excitation wavelengths from 310 to 450 nm with 20 nm increments. (b) Normalized excitation spectra of BN-CD with varying emission wavelengths from 410 to 550 nm with 20 nm increments.

Figure S3. Deconvoluted PL spectra of N-CD according to three global lifetime components obtained by TCSPC. Excitation wavelengths are given in each panel at: (a) 375 nm, (b) 450 nm, and (c) 510 nm. We performed global fitting for all kinetic profiles measured at every 5 nm to determine the amplitude of each global lifetime component.

Figure S4. Time-resolved area normalized emission spectra (TRANES) of (a) N-CD and (b) BN-CD.

Figure S5. Fluorescence decay profiles of N-CD with excitation at 450 nm monitored at (a) 500 nm, (b) 550 nm, and (c) 600 nm, respectively

Figure S6. (a) Time-resolved emission spectra (TRES) of N-CD with excitation wavelength at 375 nm. Fitting parameters are given according to stretched exponential functions (b-d). (b) The amplitudes of fluorescence lifetime components of N-CD. (c) Stretched exponential distribution factor (β) of N-CD. (d) Fluorescence lifetimes of N-CD. All decay transients were taken from 400 to 650 nm with 5 nm increments. Inset shows the normalized spectra.

Figure S1

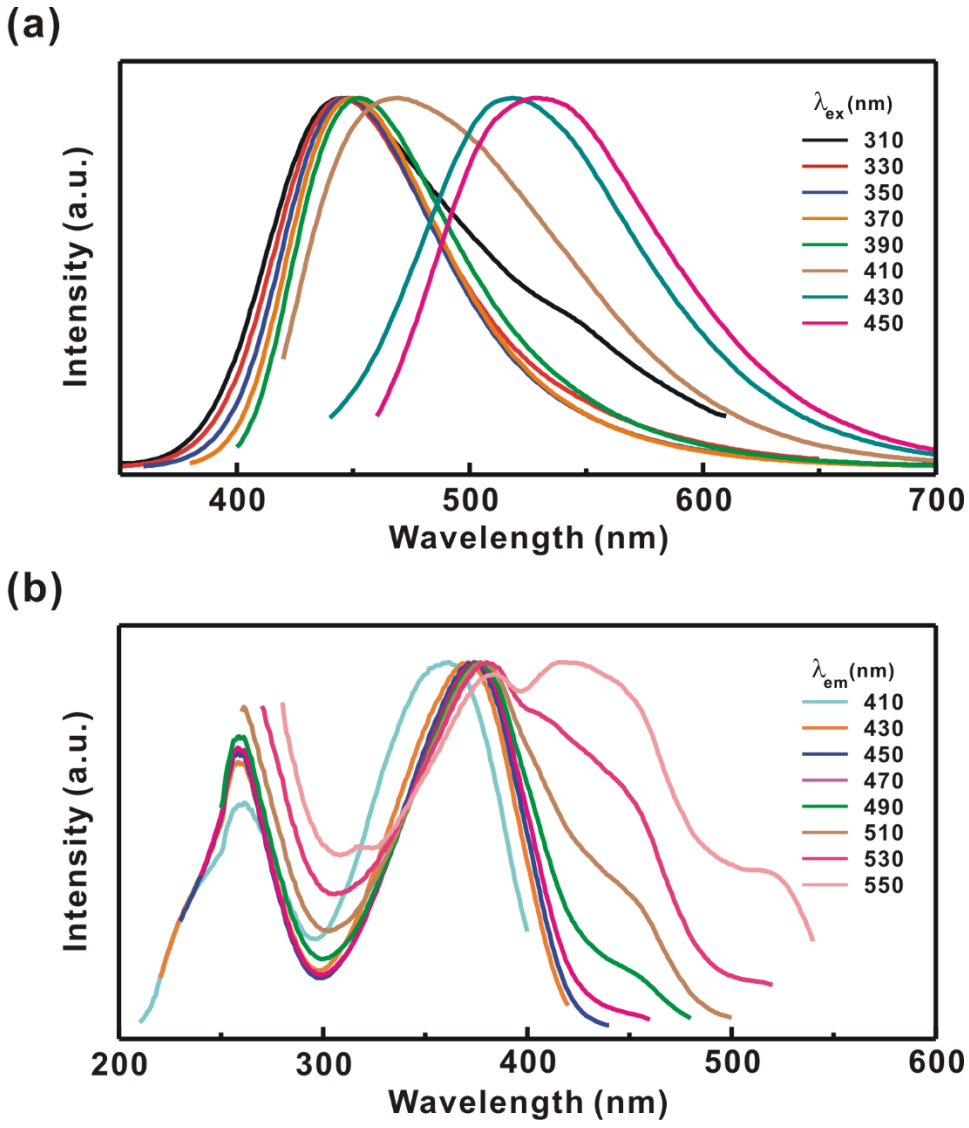

(a)
Intensity (a.u.)
400
500
600
700
Wavelength (nm)
λex (nm)
310
330
350
370
390
410
430
450
(b)
Intensity (a.u.)
200
300
400
500
600
Wavelength (nm)
λem (nm)
410
430
450
470
490
510
530
550

Figure S2

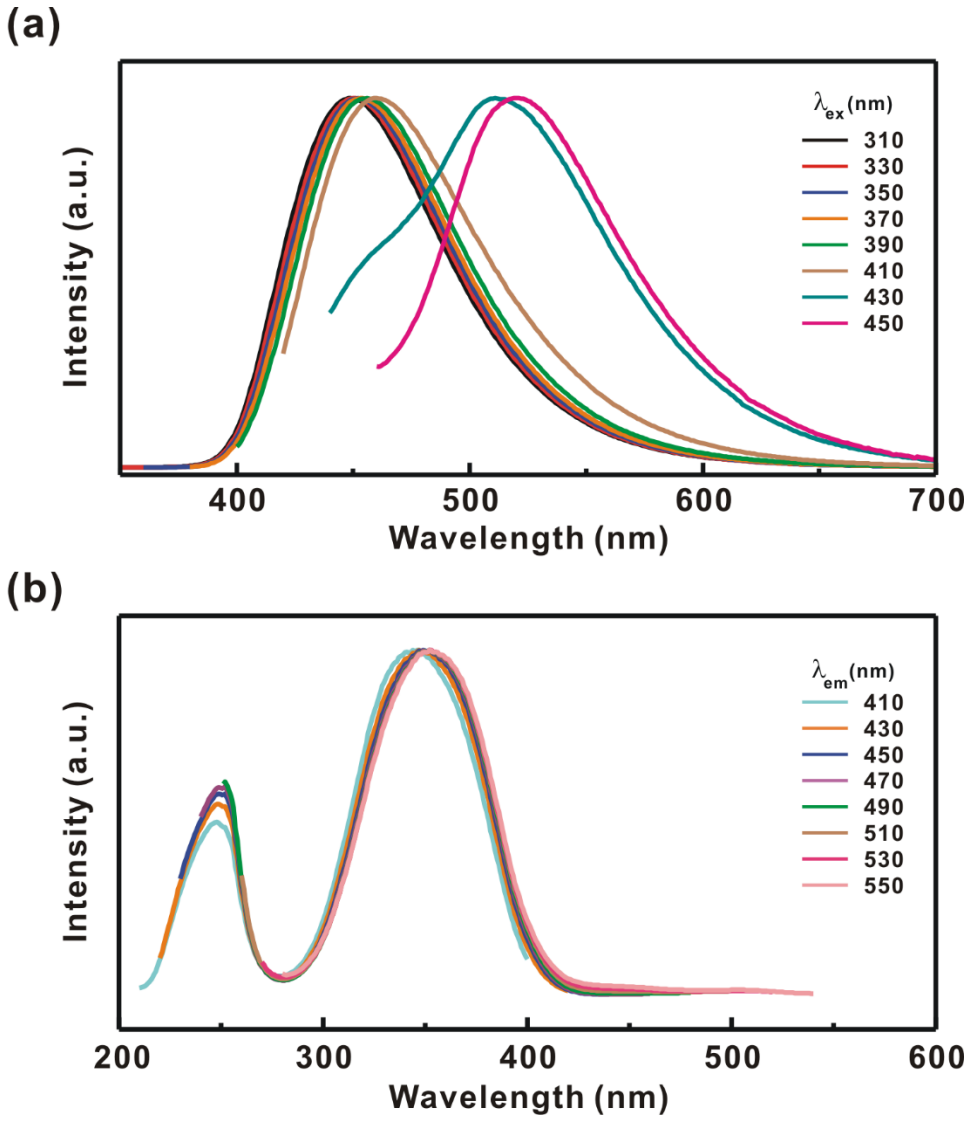

(a)
Intensity (a.u.)
Wavelength (nm)
400
500
600
700
λex(nm)
310
330
350
370
390
410
430
450
(b)
Intensity (a.u.)
Wavelength (nm)
200
300
400
500
600
λem(nm)
410
430
450
470
490
510
530
550

Figure S3

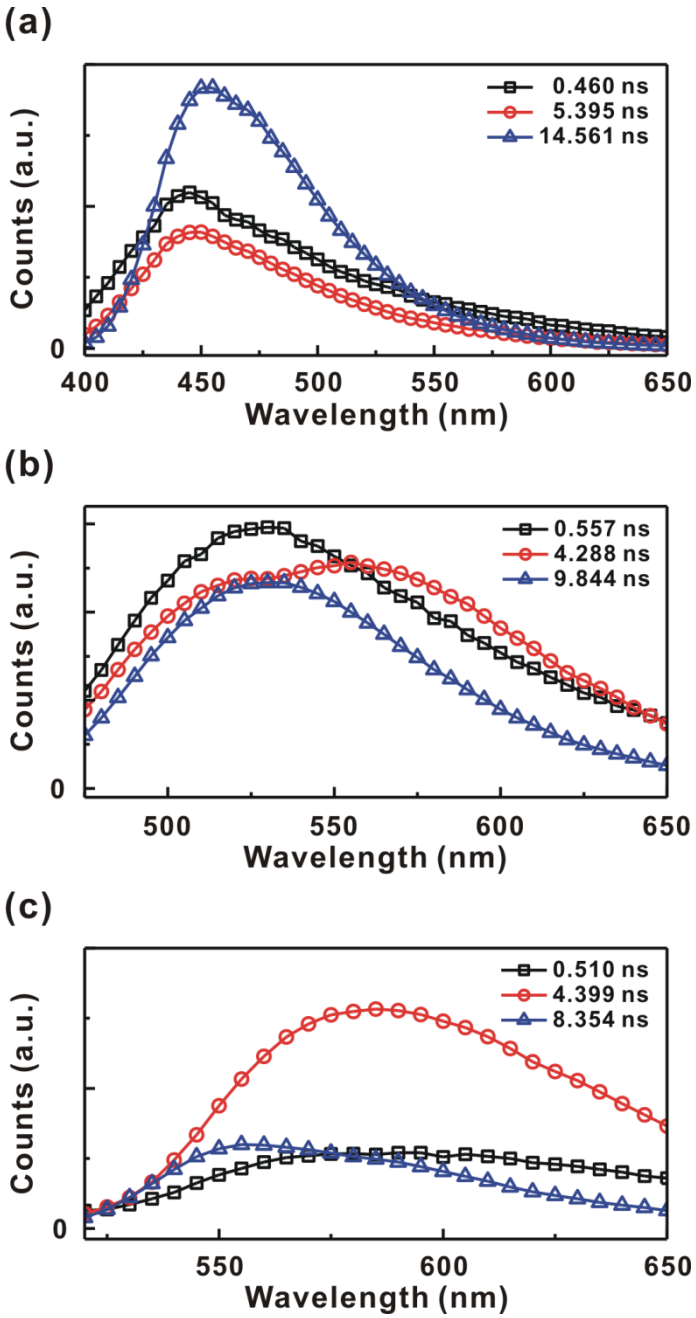

(a)
0.460 ns
5.395 ns
14.561 ns
Counts (a.u.)
0
400
450
500
550
600
650
Wavelength (nm)
(b)
0.557 ns
4.288 ns
9.844 ns
Counts (a.u.)
0
500
550
600
650
Wavelength (nm)
(c)
0.510 ns
4.399 ns
8.354 ns
Counts (a.u.)
0
550
600
650
Wavelength (nm)

Figure S4

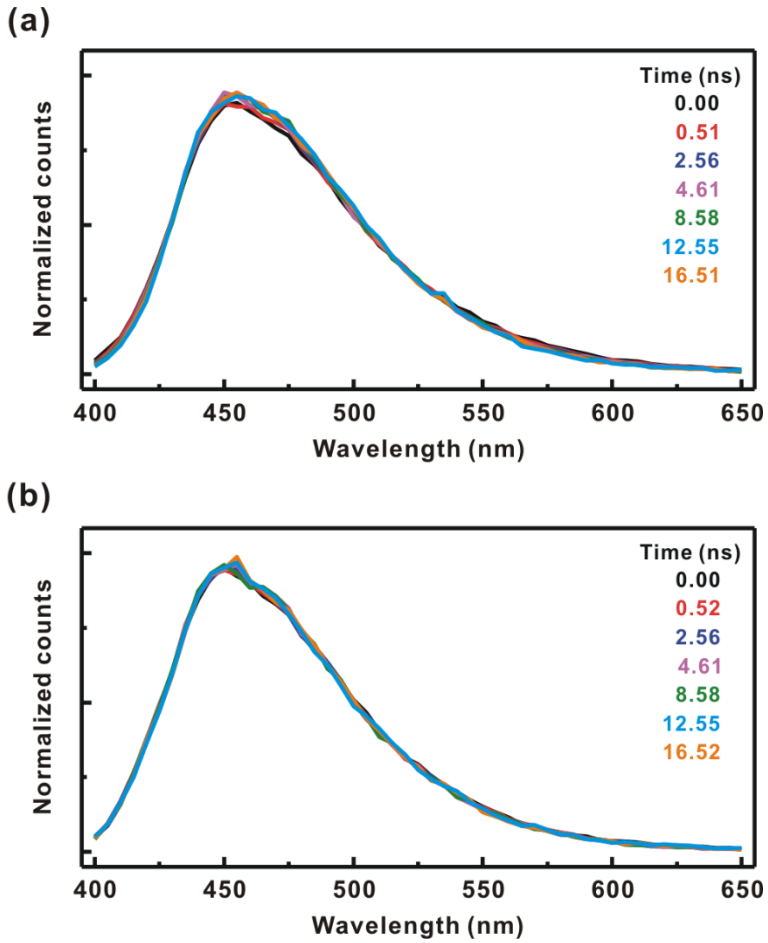

(a)
Normalized counts
Time (ns)
0.00
0.51
2.56
4.61
8.58
12.55
16.51
400
450
500
550
600
650
Wavelength (nm)
(b)
Normalized counts
Time (ns)
0.00
0.52
2.56
4.61
8.58
12.55
16.52
400
450
500
550
600
650
Wavelength (nm)

Figure S5

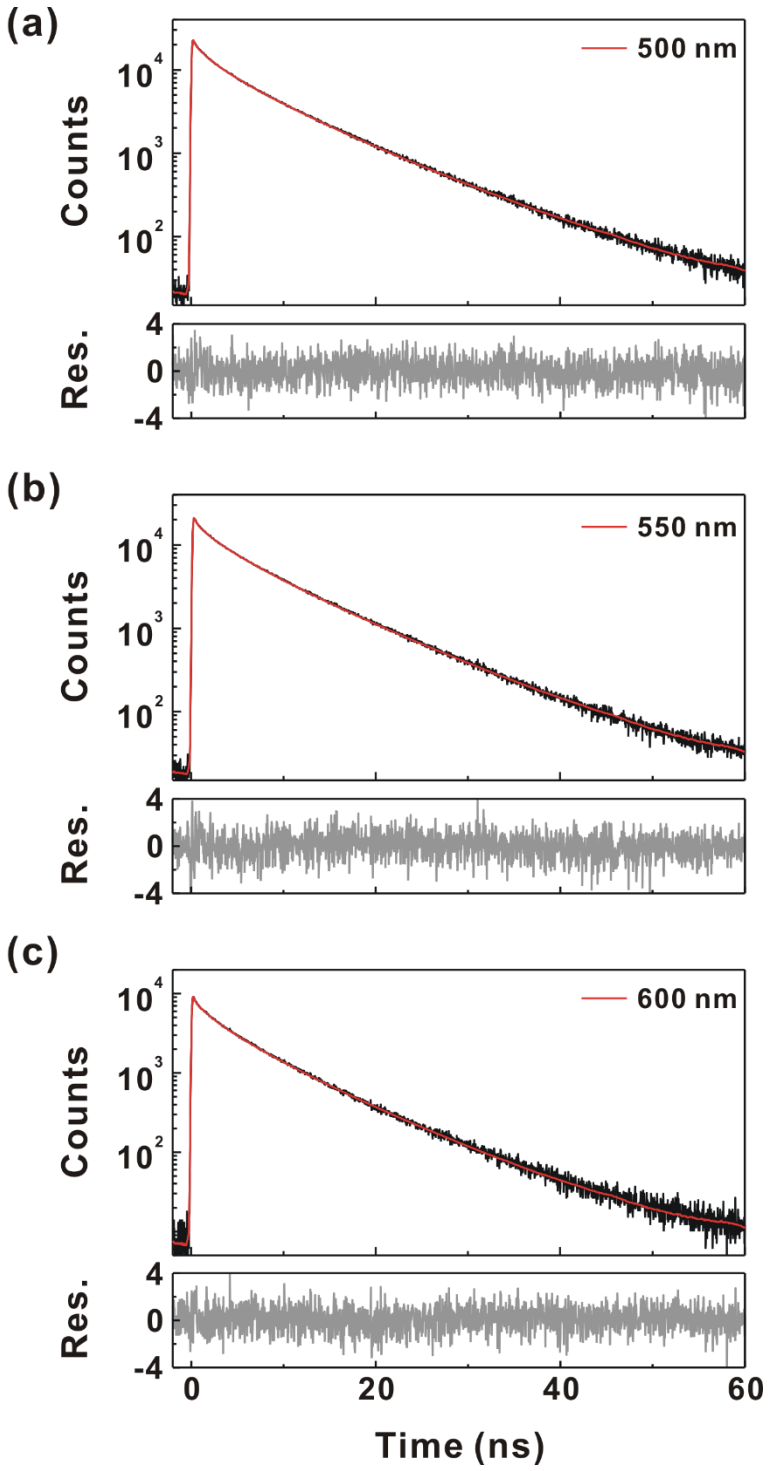
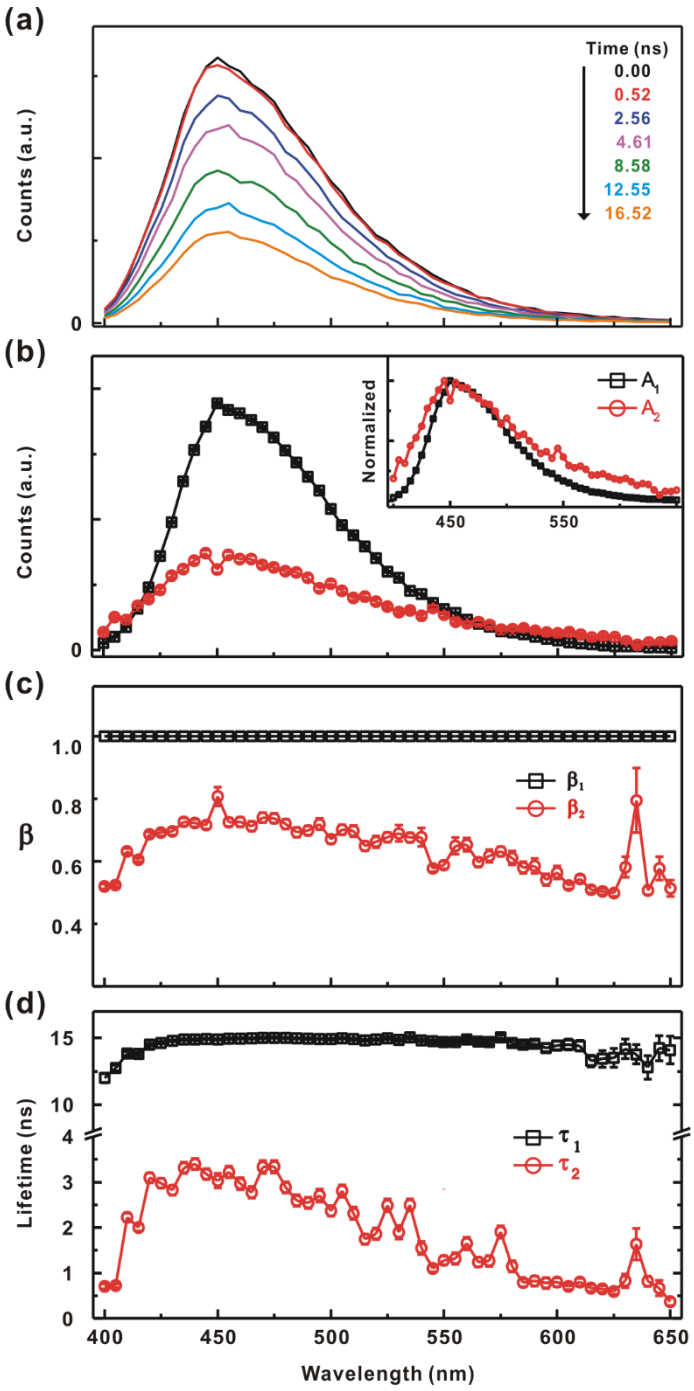

(a)
500 nm
Counts
Res.
(b)
550 nm
Counts
Res.
(c)
600 nm
Counts
Res.
Time (ns)

Figure S6


(a)
Counts (a.u.)
0
Time (ns)
0.00
0.52
2.56
4.61
8.58
12.55
16.52
(b)
Counts (a.u.)
0
A1
A2
Normalized
450
550
(c)
β
1.0
0.8
0.6
0.4
β1
β2
(d)
Lifetime (ns)
15
10
4
3
2
1
0
τ1
τ2
400
450
500
550
600
650
Wavelength (nm)